Chapter 2
The Problems of Design

Abstract HCI design is difficult, partly because of the dichotomy between the concerns of people and the directives provided by newly available technologies. There is a tension between what the devices and systems can do (objectivity), and how we experience using them and living with them (subjectively). A designer needs to know both what is technically possible, and how we think and act when our lives are mediated by technology. This chapter discusses a range of problems with the way design has been understood and is conducted. We see design as having the responsibility to ensure that people can fulfil themselves and act out their intentions in the world of things (including of technology). We raise several issues surrounding so-called human-centred design as a response to this concern, issues that we see as caused by three false dichotomies: (i) the 'cognition-action dichotomy', (ii) the 'human-user dichotomy', and (iii) the 'virtual-physical dichotomy'. The chapter also reframes the categorization of customers, users, persons and humans, allowing us to focus on new aspects of people as humans in design work.

Introduction

All HCI design is difficult, partly because of the dichotomy between the concerns of people and the directives provided by newly available technologies. There is a tension between what the devices and systems can do (objectivity), and how we experience using them and living with them (subjectively). Design as a discipline has been influenced by the basically mechanistic and dualistic worldview of the scientific tradition, by being seen as apart from this. From a Cartesian perspective, design in general is interpreted primarily as a way to create decoration to adorn the outer surface of things, to producing transitory 'feelings' without involving logical thinking. By this view, designing is seen as an activity drawing on with subjective sense experiences and imagination.

But if design is about touching people's heartstrings, it comes into being by way of a process that interweaves this sensitivity with the logic of properties of material and colours (which are subjective phenomena), functionalities and usability (which

J. Waterworth, K. Hoshi, *Human-Experiential Design of Presence in Everyday Blended Reality*, Human–Computer Interaction Series,
DOI 10.1007/978-3-319-30334-5_2

are objective phenomena), amongst many other properties (Walls et al. 1992; Hevner et al. 2004). In other words, design implies that the senses and logic, the mind and the body, the surface and the structure affect each other.

Even though it is not really possible to dissociate them, we are familiar with thinking about the origin of things in terms of a fundamental dichotomy, as either subjective or objective. The liberal arts, visual arts, music and literature are essentially human activities that carry the assumption of subjectivity. On the other hand, in the more mechanistic objective view of the universe, the whole world is seen as a closed, material system that mechanically operates according to natural, physical laws. Although adopting the latter has brought us the apparent progress of recent technological change and economical opportunities (and pressures) into our lives, it has also produced a gap between the human scale of being and the industrial scale of production. That may be a sign of success for the human race as a whole (or not), but what have we lost in the process?

Even though human life is experientially delicate, aesthetical, the industrial scale and force of technological production exposes us to rapidly accelerating change. This gap between the human scale and industrial scale has the effect of replacing design's deeper potential role with that of a promotional and presentational tool for introducing the novel fruits that technology brings us. The subjective-objective dichotomy is one of several dichotomies that we touch on in this chapter (see Table 2.1).

The essence of a human being cannot be formalized. However, in our current recklessly progressive industrial era, human beings have been seen as formalized groups of user/customers with certain objective statistical characteristics. People struggle to understand and use computers, mobile phones and other embedded computing devices, whose designs are still largely based on a formalization of human understanding of the world in terms of explicit conceptual knowledge. Because of this, people often have to adapt themselves to the mediated computing environment (if they can), because human sensation and perception are essentially embodied and thus implicit phenomena.

The human being and the user/customer have been separated, in other words. The nature of actual human beings has been lost within formalized user/customer groups.

Table 2.1 Examples of dichotomies in design

Subjective	Objective
Mind	Body
Liberal arts	Natural sciences
Human/person	User/customer
Internal	External
Implicit	Explicit
Virtual	Physical
Experiential	Practical
Human-experiential design	User-experience design

Even applied observation techniques used in recent design processes commonly see their subjects as people who use products in general, who tell stories as users, who use a particular product. The needs of human beings, and perhaps especially the vulnerable, the elderly and the socially handicapped, have become increasingly unsatisfied by the unbalanced environment created with mediating information technology. We believe that they should no longer be expected to tolerate the problems that much current design of technology brings (Waterworth et al. 2009a, b). We discuss some of these practical problems in more detail, as well as ways in which they can be addressed in Part III of the book.

The Cartesian mechanistic view underlying much of science has brought an undesirable gap between people and their increasingly technology-mediated environment. It seems that objectivism reigns supreme especially in science. When design is seen through a scientific lens, 'design science' becomes a blind acceptance of the objective position. In contrast, our view is that there is no absolute design science or designed products that reveal objective truths about the world. What is prominent and fair design in one culture is often poor design in another culture, even though they may make for successful business in both.

Objective Versus Subjective Views of Design

Design has often been viewed as a craft, as tacit, unknowable and experiential, and designers are viewed as subjective and not purely rational or objective - but this is mostly by people other than actual design practitioners. This subjective perspective can be summarized in the following points (taken from Lakoff and Johnson 1980, p. 188, summarized and modified). This is "*the myth of subjectivism*":

- Designers' senses and intuitions are their best guides for design activities. They rely on their senses and develop intuitions they must trust.
- Designers believe that feelings, aesthetic sensibilities, moral practice, and spiritual awareness are essential in human life, and are good design resources and practices.
- Art, music and poetry and so on put designers in touch with the more important reality of their feelings and intuitions. Designers gain this awareness through imagination rather than reason, rationality and objectivity.
- Designers use the language of the imagination for expressing the unique and most personally significant aspects of their experience. Ordinary explicit language is not suitable for matters of personal understanding.
- Designers believe that objectivity can be dangerous, because it misses what is most important and meaningful to individual people. Therefore, they believe that objectivity can be inhuman, and it is harmful for true 'human-centred' design.

In contrast, people who believe that science is absolute truth that can give a correct, definitive, and general account of reality through the application of scientific methodology, claim the following with respect to design. This is "*the myth of objectivism*", summarized and modified (Lakoff and Johnson 1980, p. 186):

- To the extent that scientists are objective, science is rational. To the extent that designers are subjective, to design is irrational and is to give in to the emotions.
- Whereas scientists are objective, designers are subjective indulgers since they emphasize the importance of the personal point of view.
- Scientists are objective and always fair. Therefore they can avoid personal prejudice and a biased view of the external world.
- Science provides us with a methodology that allows us to be fair, understanding things from a universally valid and unbiased point of view. On the other hand, design relies on the personal judgments of a designer.
- Scientists deal with only objective knowledge that is absolute knowledge. They speak objective language that is clearly and precisely defined, that is straightforward and direct, and that can fit reality. Designers use poetic, fanciful, rhetorical, and figurative language in ways such that meanings are not clear and precise and do not fit reality in an obvious way.
- There is an objective reality, and scientists can say things that are objectively, absolutely, and unconditionally true and false about it. Illusions, errors of perception, errors of judgment, emotions, and personal and cultural biases are human error.
- Scientists believe that the world is made up of objects that have properties independent of any people or other beings that experience them. For example, a rock is a separate object and it is hard.
- Scientists believe that we obtain knowledge of the world by experiencing the objects in it and getting to know what properties the objects have and how these objects are related to one another. Therefore they believe that subjective thought and intuition can be dangerous, since they can be lead to losing touch with reality.

Viewed from these mythical perspectives, the position of science reflects the view that the external world needs to be understood so that humans can live properly in it. The position of design is focused on internal aspects of understanding the world. Designers intend to address what makes human life meaningful and worth living. On the other hand, the position of science says that, for example, the elements of the universe as separated from each other, divisible and wholly isolated.

The Cognition-Action Dichotomy

In his Discourse on Methods (1637), Descartes argued that we exist as thinking beings, different from brute animals. The world is made up of two separated substances; physical substances (bodies) and mental substances (minds). This Cartesian view underlies much of science, and has allowed vast areas of understanding of previously mysterious phenomena to develop and flourish. On the other hand, the dichotomy has brought undesirable effects, and is even reflected in HCI, in various aspects of so-called ‘Human-centred design’, as we shall see. It has made it extremely difficult to find a place in our views of human meaning and rationality for structures of imagination. As Johnson (1987, xxix) expressed it: “Imagination seems to exist in a no-man’s-land between the clearly demarcated territories of reason and sensation.”

Traditionally, HCI researchers have the assumption that the brain functions to construct and utilize representations of the world around us, via ‘a model of the world’ (Craik 1943; Reed 1996). The human organism must collect, collate, and interpret stimuli until it has an internal model of the world constructed by the brain (or mind), in order to let it send commands that will cause its body to behave in suitable ways. Several scholars and disciplines have argued against the limitations of this cognitivist view of HCI, as found in discussions in terms of augmented and mixed realities, tangible interaction, and situated action (e.g. Dourish 2001; Suchman 2007). We return to these later.

Lakoff refers to the view that the mind is a computer with biological hardware:

> the mind runs using programs essentially like those used in computers today and it may take input from the body and provide output to the body, but there is nonetheless a purely mental sphere of symbolic manipulation that can be characterized in terms of algorithms of the sort used in computer programs. (Lakoff 1987, p. 338)

Such mechanical systems all have one thing in common: They must have an external agency in order to let them act. Based on this assumption, it may be true that a tool is something that extends the action of workers. Therefore a tool, for example a computer, can do this only because workers and other sources of power bring it into action. Designers of interactive systems adopting this cognitivist view have tended to assume that every emergence of action/behaviour needs a stimulus either from outside the system or from inside. These are so-called reactive mechanisms based on external stimuli and instructive mechanisms based on internal stimuli or commands, according to some theories of ecological psychology (Reed 1996).

Whereas machines need a stimulus to bring them into action, animals are always active in whole or in part. We experientially know also that humans are always active and different from machines. And even though machines, tools and computers are not active in the way that animals are, interactive systems have been designed on the basis of modelling animal and human behaviour on mechanical principles. For example, Card et al. (1983) introduced the idea of a model human processor (MHP) in their GOMS (goals, operators, methods and selection rules) approach to understanding interaction. The MHP describes human behaviour in terms of memories, processors, their parameters and interconnections. It is supposed to be used for approximate prediction, such as the assumed information processing capacities of a person, gross behaviour, and user behaviour in HCI, by applying a simplified view of psychological theories and empirical data. The MHP can be said to be an integration of a set of memories and processors.

The MHP is composed of three subsystems that have their own memories and processors: the perceptual system, the cognitive system and the motor system. The perceptual system consists of two different image stores: an auditory image store and a visual image store. While it is being symbolically encoded, the output of the sensory system is retained. The cognitive system receives information symbolically coded from the perceptual system that contains the sensory image stores in its working memory and employs information previously stored in long-term memory to decide about how to react. The motor system then carries out the responses. There is a separate processor in each subsystem: a perceptual processor, a cognitive processor and a motor processor, which have a capacity for both serial and parallel processing.

The cognitivist view considers that users act rationally to obtain their goals. On this base, we can predict a user's behaviour by determining the user's goals, methods and operators and the constraints of the task. This has been formulated in the GOMS approach, which helps predict user's behaviour, based on the assumption that

> underlying the detailed behaviour of a particular user there are a small number of information processing operators, that the user's behavior is describable as a sequence of these, and that the time the user requires to act is the sum of the time of these individual operators. (Card et al. 1983, p. 139)

The GOMS model specifies the components that a user's cognitive structure is supposed to be composed of: a set of goals, a set of operators, a set of methods for attaining the goals, and a set of selection rules for choosing appropriate methods for goals. By this and similar approaches, HCI largely concerns itself with the complex environmental conditions in which humans are put into motion via stimuli (as inputs received by the brain). Their behaviours are responsive outputs generated by the nervous system. The human "operator" is essentially seen as a computing environment interacting with another, external computing environment.

We can find challenging and interesting applications for educational, medical and industrial usage designed on the basis of such basically mechanical principles, but many are not at all suitable for actual people, and especially not for people with special needs. People, as human beings, are forced to adapt to the external computing environment based on mechanistic principles, even though human behaviours can be seen instead as essentially a natural flow of action based on constant activity. In this kind of approach, design is rational to the extent that a designer is being objective.

The Human-User Dichotomy

HCI designers historically sought a new concept of "user interfaces", especially for office workers, since computer users were historically almost all office workers. The designers therefore tried to evoke explicitly people's knowledge of office work to help them understand the operation of the computer.

The typical design approach to HCI design used metaphor in order for users to understand how to use a computing system (Imaz and Benyon 2006; Waterworth et al. 2003). This encompasses what users feel, think, and are able to do as they interact, and has often been called *User-Experience Design* in the last few years.

The user-experience designer tries to help users' understand the system by adopting users' experience in another domain (Imaz and Benyon 2006; Waterworth et al. 2003) and applying it in design. Over the past 30 years or so, more and more interface designers have adopted this style. Recently it has been spreading to other devices such as mobile phones, digital cameras, audio-visual equipment, and most web sites used in everyday life.

But user-experience design is a very fuzzy concept and the term is used in many different ways. User experience design is supposed to be rooted from the principles of human-centred design as defined, for example, in ISO 13407 (1999). In essence, user-experience design conforms to human-centred design principles. Whereas human-centred design as defined in such standards largely focuses on traditional usability factors, recent user-experience design focuses more on factors relevant to affect, interpretation and meaning (Roto et al. 2011). Designers, especially user-experience designers, emphasize that user-experience design focuses on humans and their experiences with and of technology, not merely on using the technology. We can find a number of definitions of user experience design in academic papers (Alben 1996; Hassenzahl and Tranctinsky 2006; Sward and MacArthur 2007; Hekkert 2006; Hassenzahl 2008; Colbert 2005) and well-known websites such as www.nngroup.com (Nielsen-Norman Group); www.upassoc.org (Usability Professionals' Association); and www.interaction-design.org.

There are also other approaches to understanding user experience, such as co-experience, shared experience and group experience, which focus on the social aspects that are hypothesised as contributing to the construction of experience (Hassenzahl 2010). Since digital products, computers and mobile phones have become distributed almost everywhere, social and cultural aspects of design are becoming increasingly important. Recent approaches consider the situations in which experiences are constructively formed and where participants mutually create interpretations and meanings from everyday life contexts, thus allowing for co-evolution of designs with social practices (Battarbee 2003).

Even though there are many definitions of user-experience design, it is not easy to find any distinction made between being a user of technology and a human being. A user is typically conceived of as focused on foreground tasks through full access to a central display. The mouse is used as part of a two dimensional paradigm that assists with easy spatial navigation of the displayed contents, by clicking, dragging, selecting and operating on 2D graphical objects. Although this is in some ways a flexible approach, two-dimensional input-output interface is still limited when applied to many activities, for example face-to-face collaboration or in fundamentally distributed environments. People have again to adapt to the limited computing environment, which breaks their natural flow of action.

To define true human-centred design would be to give an answer to the question of who we are as humans. This assumes that we are not merely segmented customers or just users of technology, and much less are we predictable machines. Given the correct design approach, people need not – indeed should not – be aware of themselves as users. Design should aim to realize an ideal in which our activities are characterized by a natural flow of action, without any intrusions from technology. It is time to consider reframing audiences from users to humans. Human is a universal concept. It includes the young, the old, and those with special needs such as patients, elderly people and those with disabilities. In fact, all people, as human beings, have special needs. If we take this view seriously, how would 'users' be redefined?

Users and User-Centred Systems Design

According to the Oxford Dictionary of English (2003), A user is '*a person who uses or operates something*.' In computing, a user is a person who uses computer hardware/software or an Internet service. However, what do users actually do in their use of these artefacts/products?

As a term, User-Centred System Design (UCSD) was introduced by Donald Norman and Stephen Draper (1986), and reflected the already ongoing development of User Centred Design (UCD) in the 1980s. Keinonen (2008) states that: "UCD is a broad umbrella covering approaches such as traditional human factors and ergonomics, participatory design, human-centred design processes, usability measurements and inspections, and design for user experience" (p. 211). Humanistic roles of design were emphasized and widely brought over into the product development process, which became and remains a dominant subject in HCI. Later, the human-centred design concept was developed and applied to overcome the design weaknesses of software products with WIMP (windows, icons, menus, pointer) graphical user interfaces. The process contributed to the evolution of the standard WIMP interface and of the growth and success of consumer information technology in the market.

Since the advent of modern WIMP interfaces launched for ordinary people, and especially for the office work environment, computing for the masses has continued to grow. The domain of HCI has been continuously expanding into our everyday life. Using standard office type applications, such as word processors, databases, and spread sheets became a common part of our lives, even though people in everyday life are essentially not office workers. 'User', inheriting meaning from users in office settings, is still in the centre of the product development process as a guiding concept.

User-centred design approaches have been repeatedly emphasized in both design literature and practical development practices. There is also an ISO standard for the user-centred design process with an emphasis on user participation in the system development process (ISO 13407 1999). The standard provides guidance on "human-centred design activities throughout a development life cycle of computer-based interactive systems", but does not specify detailed methods and techniques. The usability, accessibility and understandability of the products have been improved by emphasizing user centredness, of listening to the user's voice.

Although there has been much improvement in these areas, the complexity of the products remains high. Even companies who claim to follow human-centred principles have released complex, confusing products. In both academia and industry, many disciplines and professionals use the terms user-centred and human-centred design without any clear distinction. In the domains of interaction design, HCI, and information systems design, many use such generic terms as human-centred computing (HCC), human-centred design (HCD), and human-centred systems (HCS) in a simplistic way without a common foundation of understanding (Bannon 2011).

In order to understand the complexity of users, applied user observation techniques based on working more closely with users have been introduced, such as ethnographic studies and participatory design. Interdisciplinary groups formed with such professionals as anthropologists, psychologists, and designers, are often involved in the development process. According to Mactavish (2009, p. 121), gathering quantitative data about user activity and behaviour (for recent products such as mobile phones, personal digital assistants, and various computer applications) includes formal study of task productivity based on learning time, task initiation time, task completion time, task completion success rate, operator error rate, error recovery tasks, error recovery time and so on. Researchers normally aggregate these data by direct observation or video capturing, logging data based on various interaction aspects, sometimes with biometric monitoring (Mactavish 2009).

Sato (2009, p. 30) characterises the knowledge cycle between artefact development and user. According to him, development groups generate knowledge by analysing users and usage of artefacts and embed it in future artefacts. Users also produce knowledge by using, reading and interpreting embedded knowledge in the artefacts, and understand the significance, meaning, and validity of using the artefact in various situations in their everyday life. What has been discussed in the recent user-centred design process exemplifies the knowledge cycle between artefact development and the user.

A user-centred design process can thus be seen as a process centring on the knowledge lifecycle that includes knowledge of use, knowledge of design and the user who generates knowledge through interpretation of embedded design knowledge in artefacts/products. It begins by observing the activities and interactions of users in a certain situation. Hence, users can be defined as; *people who have knowledge of use and generate knowledge relevant to artefacts/products in a knowledge lifecycle between user*, *artefact and artefact development*. User-centred design is a design activity based on the cycle of this mainly explicit knowledge of use.

In the process of practical design development, industry practitioners also use customer data for interpreting, understanding, and discovering customer value-based demands (Mello 2002). This enables companies to find not only new markets but also repeatable product life cycles and measurable product development cycles. Here, there is a simple question. Although 'user' can be defined, how can 'customer' be defined? What are the differences between users and customers in the information gathering process?

What Is a Customer?

In general, a customer is "*a person who buys goods or service from a shop or business*" (Oxford Dictionary of English 2003). 'A customer' more specifically refers to a current or potential buyer or user of the products of an individual or organization that is usually called the *supplier*, *seller*, or *vendor* through purchasing or renting goods or services. Depending on the industry, a customer may also be called a *client*, *buyer*, or *purchaser*. There is a place where buyer and seller meet, which refers to a set of potential customers, the 'market'. If buyer refers to a customer, then seller refers to a company/corporation. Organizations sometimes use terms and phrases such as "customer-oriented, customer-driven, listening to the voice of the customer, customer-centric, customer awareness, and customer retention" to emphasize that the customer and the market drive the business (Mello 2002, p. 4). This results in what is sometimes called 'customer-centred design'. Since industries often exploit user-centred design as a tool to get their own customers, 'customer' and 'user' have been frequently confused or used interchangeably.

A business strategy, regarded as essential for success in the market, is a plan of action designed to accomplish credible defined goals that generally include "sales volume, rate of growth, profit percentages, market share, and return on investment (ROI), among others" (Rosenzweig 2003, p. 1). These concepts help to understand a market rather than give an understanding of users and the usage of products. Markets can be represented accurately in terms of segments. The first task of a marketing group is to identify relevant market segments, which creates a framework for developing market strategy with segmentation variables such as "demographic, geographic, psychographic, product use and application so on" (Rosenzweig 2003, p. 3). Some may be defined as subsets of other variables. For example, the marketing people may segment the world in terms of country markets and then analyse each, using lifestyle variables.

In the segmentation process, human beings are formalized into customer groups. For example, according to Rosenzweig (2003), demographic segmentation categorises people using family income, age, sex, ethnicity, and education level as explanatory variables predicting differences in taste, buying behaviour, and consumption patterns (p. 3); while psychographic segmentation categorises consumer lifestyle according to parameters such as attitudes towards self, work, family and peer group identity (p. 4). There are a variety of techniques and methods, but they are all ways of formalization of human to customer. In such approaches, 'customer' is represented as an abstract person with objective statistical characteristics.

Human-Centred and Human-Experiential Design

We tend to believe that most of our actions are carried out consciously. It is, however, our unconscious behaviour that preserves the natural flow of action in many situations. We become harmonized to things that all of us end up doing without really thinking. For example, in specific situations, placing something for convenience, holding hands to ones forehead because of blinding sunlight, and bringing up a cool canned drink to ones cheek are universal and instinctive, drawing on experiences with mind, body, and environment so embodied that they are largely unconscious. According to Suri (2005, p. 164), "this awareness is evident from our actions, even when we are not conscious of them. These are unconscious behaviours." A sequence of largely unconscious interpretation and adjustment creates our behaviour.

It is difficult for self-aware humans to realize that the environment is the driving force behind human interpretation, because introspection tells us that human behaviour is caused by human conscious intentions. In reality, it is meaningless to think of mind, body, and environment as existing separately. Our reality is composed of a complex of customs, social situations, personal experience, culture and objects, and our environment determines our being to an inconceivable extent. Awareness largely follows behaviour, rather than vice versa.

Some design practitioners have intuitively observed people in everyday life, examined these everyday interactions, and sublimated their thought from these observations into their design solutions (Suri 2005; Hosoe et al. 1991; Goto et al. 2004). They discover a lot about how people physically and perceptually blend with their surroundings. They look carefully at what people actually end up doing in everyday life: why have people put something here in a certain way? What are the people making a certain pose doing there and why do people respond to an object in the way they do? Why did people react in that way? Introspection can sometimes reveal what is of value to us behind these everyday interactions that occur around us all the time, but in fact we are not usually consciously aware of our actions and reactions. By this view, humans can be characterized as; *people who intuitively interpret what is of value for their purposes in their current environment and try to become harmonious with it in everyday life activities*.

To understand this phenomenon, there is a key concept – affordance – from ecological psychology. James J Gibson, in his book *The Ecological Approach to Visual Perception* (Gibson 1978), coined the term 'affordance' from the verb 'to afford'. According to his theory, a chair possesses an affordance for sitting, but the chair does not force a person into sitting. People may find themselves sitting without any awareness of having decided to sit. Further, a chair affords the prospect of sitting regardless of a person's health, condition or mood. Affordances seem to draw on our natural flow of action in specific situations. Every organism including humans utilizes affordances in the environment. Affordances are something that everyone knows intuitively and largely unconsciously; they are innumerable, complex and mysterious.

Similarly, people sometimes get healing from paintings, poems and music. They sometimes end up crying when they are in a church. They are then human, neither customer nor user. As Dutton suggests,

> the most recent research on universal features, for example in art, has come out of evolutionary psychology, which attempts to understand and explain the experience and capacities of the human mind in terms of characteristics it developed in the long evolutionary history of the human species. (Dutton 2001, p. 283)

Table 2.2 Categorization of audiences

Audience	Definition
Customer	A set of potential people based on segmentation variables such as demographic, geographic and psychographic criteria among others
User	People who have experience of use and generate knowledge with artefacts/products in a knowledge lifecycle
Person	People who intuitively interpret what is of value for their purposes in the current environment and seek balance in everyday activities
Human	People with the same evolutionary history and bodily structure and hence the same primitives for understanding information

In everyday life, we encounter the embodiment notion, resting on the idea that the mind and the body, or cognition and action, are fundamentally associated in human experience. Following a perspective based in the ‘Experiential Realism’ of (Lakoff 1987; Lakoff and Johnson 1999), we find that “human beings understand their experiences largely depending on basic, bodily interactions with physical environments, as well as on social and cultural interactions with other humans” (Waterworth et al. 2003, p. 137).

All human beings draw on the same primitive experiences that cover our shared embodied knowledge evolved over thousands, even millions of years (Waterworth et al. 2003; Hosoe 2006). Humans are organisms who share the same evolutionary history and hence, bodily structures and potential for experiences. Because of this, they also share the same primitives for understanding information – which is the fundamental principle underlying human-experiential design applied to interaction. The place of the human in a categorization of audiences is shown in Table 2.2.

The Virtual-Physical Dichotomy

Since the ubiquitous GUI was introduced and became the standard paradigm in HCI, it has contributed enormously to the development of society, especially the way we work. Recently, we have witnessed the emergence of a wider variety of HCI technologies, such as those implemented within sensor-based gaming environments, handheld smart phones with more intuitive onscreen interfaces and orientation sensors, etc., and these are now gradually penetrating society. However, we still cannot effectively utilize our skills for manipulating physical objects to any great extent, even though that would improve the nature of interaction. Research work on tangible interaction has been mostly focusing on numerous but narrow activities such as the manipulation of building blocks or shaping models out of virtual/physical clay (Ishii 2008).

Currently, we live in the physical world in which computers are distributed, with interaction windows onto the virtual world provided by the display, keyboard, and mouse, or touch-sensitive surface. It is not a surprising idea to combine in ‘the interface' the virtual and the physical aspects of an interactive device, since the user sees the product itself as a unified physical/virtual system. But the rest of the physical world, and most of the bodily skills and experiences of the user, lie outside this unified and defined world. Users are further limited by a variety of factors, such as physical display constraints, input-output constraints, and social constraints. For example, physical display constraints mean that the user usually concentrates on only foreground tasks with full access to only a single display surface.

The evolution of interaction techniques has largely also been the history of improving the usability and appeal of the WIMP-based GUI. These work well in many situations, most obviously and importantly for many kinds of office or similar work. The work and the style of interaction have co-evolved and reinforced each other: we do the work we do because of the tools we have, and we have the tools we have because of the work we do.

Several researchers have discussed ways to modify or even escape from this self-perpetuating trend and have, for example, experimented with sensor-based techniques for interacting with virtual entities via the manipulation of physical objects in space (e.g. Ishii 2008; Ishii et al. 1998). Most of the broad range of new interfaces developed by HCI researchers are presented as alternatives to the current GUI paradigm and try, in one way or another, to diverge from the WIMP-based approach (Jacob et al. 2007). Better approaches for many types of people, including those with special needs such as the elderly and the socially or physically handicapped, draw on other principles such as free body movement, de-centralised displays, and tacit knowledge (Zacks et al. 2007; Schacter 1987; Benjamin et al. 1994).

We can find numerous emerging post-GUI/WIMP interaction styles, and they constitute a huge growing trend in the HCI literature, because of their clear advantages of bringing more real, more tangible and more usable interaction. Typical examples are; augmented reality, tangible interaction, ubiquitous and pervasive computing, context-aware computing, handheld, or mobile interaction and so on (Jacob et al. 2008). Recently, we have witnessed the emergence of a wider variety of HCI technologies, including handheld smart phones with more intuitive onscreen interfaces, which are pervasively penetrating into our everyday life.

Technology creates the virtual world, but also exists in the physical world with which the virtual often competes for our attention. Many of these new interaction styles clearly exhibit a combination of the physical and the virtual, sometimes called mixed reality. Today mixed realities of various kinds are an increasingly prevalent approach to interaction that strives to combine the physical and the virtual. Mixed reality is also a growing object of study for the HCI research community, as part of a widespread effort to develop viable and more flexible alternatives to WIMP-based GUIs. But do these interaction styles really have many benefits for those who use them? In terms of the perceptual and psychological aspects of use, the effect of these post-WIMP interaction styles has yet to be fully studied and understood.

Another post-WIMP trend is that digital media are becoming more pervasive in our built environments, and include devices such as video screens, electronic access systems, and sensor-based smart environments. But there is still a huge gap between the digital media and humans as bodies in physical space.

We predict that the intersection of sensory, cognitive and emotional aspects in emerging mixed realities will be significantly important in attempts to go a further step in the development of better combinations between the physical and virtual environment, in what we call *Blended Reality Space* (first proposed in Hoshi et al. 2009).

We return to the notion of blended reality space later in the book (especially in Chap. 5). In brief, it is an interactive mixed reality environment where the physical and the virtual are seamlessly combined and affect each other. In a true blending of the physical and the virtual, the technology itself would completely disappear from our perception. In such a situation, there will be no conscious effort of access to information (Waterworth and Waterworth 2010). It would then be possible to realize an ideal in which our activities are supported by technology and yet characterized by a natural flow of action, without any intrusion from the technology, from the physical-virtual divide. The human user would perceive and act directly, as in everyday life unmediated activities.

References

Alben L (1996) Quality of experience: defining the criteria for effective interaction design. Interactions 3(3):11–15

Bannon, L. (2011). Reimagining HCI: toward a more human-centered perspective. Interactions 18(4):50–57. NY, ACM

Battarbee K (2003) Defining co-experience. Paper presented at the the international conference on designing pleasurable products and interfaces. ACM Press, Pittsburgh

Benjamin LT, Hopkins JR, Nation JR (1994) Psychology, 3rd edn. Macmillan College Publishing Company, New York

Card SK, Moran TP, Newell A (1983) The psychology of human-computer interaction. Lawrence Erlbaum Associates, Mahwah

Colbert M (2005) User experience of communication before and during rendezvous: interim results. Pers Ubiquit Comput 9(3):134–141

Craik KJW (1943) The nature of explanation. Blackwell, London

Descartes R (1637) Discourse on the method, etc. Published on-line by Project Gutenberg. http://www.gutenberg.org/files/59/59-h/59-h.htm

Dourish P (2001) Where the action is: the foundation of embodied interaction. The MIT Press, Cambridge, MA

Dutton D (ed) (2001) Aaesthetic universals. Routledge, New York

Gibson JJ (1978) The ecological approach to visual perception. Lawrence Erlbaum Associates, Publishers, Hillsdale

Goto T, Sasaki M, Fukasawa N (2004) The ecological approach to design. Tokyo shoseki, Tokyo

Hassenzahl M (2008) User experience (UX): towards an experiential perspective on product quality. Paper presented at the IHM 2008. Metz, France

Hassenzahl M (2010) Experience design: technology for all the right reasons (synthesis lectures on human-centred informatics). Morgan and Claypool Publishers

Hassenzahl M, Tractinsky N (2006) User experience – a research agenda. Behav Inf Technol 25(2):90–97

Hekkert P (2006) Design aesthetics: principles of pleasure in design. Psychol Sci 48(2):157–172

Hevner AR, March ST, Park J, Ram S (2004) Design science in information systems research. MIS Quaterly 28(1):75–105

Hosoe I (2006) A trickster approach to interaction design. In: Bagnara S, Smith GC (eds) Theories and practice in interaction design. Lawrence Erlbaum Associates, Mahwah, pp 311–322

Hoshi K, Pesola UM, Waterworth EL, Waterworth J (2009) Tools, perspectives, and avatars in blended reality space. Cyberpsychology Behav 12(5):617–619

Hosoe l, Marinelli A, Sias R (1991) Play office: toward a new culture in the workplace. GC inc., Tokyo

Imaz M, Benyon D (2006) Desining with blends: conceptual foundations of human-computer interaction and software engineering. The MIT Press, Cambridge, MA

Ishii H (2008) Tangible bits: beyond pixels. Paper presented at the The 2nd International Conference on Tangible and Embedded Interaction. ACM Press, Kingston

Ishii H, Wisneski C, Brave S, Dahley A, Gorbet M, Ullmer B et al (1998) ambientROOM: integrating ambient media with architectural space. Paper presented at the CHI 98 conference summary on Human factors in computing systems, New York

ISO 13407 (1999) Human-centred design processes for interactive systems. International Organization for Standardization

Jacob RJK, Girouard A, Hirshfield LM, Horn MS, Shaer O, Solovey ET, et al (2007) Reality-based interaction: unifying the new generation of interaction styles paper presented at the CHI '07 extended abstracts on Human factors in computing systems

Jacob RJK, Girouard A, Hirshfield LM, Horn SM, Shaer O, Solovey ET et al (2008) Reality-Based interaction: a framework for Post-WIMP interface. Paper presented at the twenty-sixth annual SIGCHI conference on Human factors in computing systems, Florence, Italy

Johnson M (1987) The body in the mind: the bodily basis of meaning, imagination and reason. University of Chicago Press, Chicago

Keinonen T (2008) User-centred design and fundamental need paper presented at the The 5th Nordic conference on human-computer interaction

Lakoff G (1987) Woman, fire and dangerous things: what categories reveal about the mind. The University of Chicago Press, Chicago

Lakoff G, Johnson M (1980) Metaphors we live by Chicago. The University of Chicago Press, Chicago

Lakoff G, Johnson M (1999) Philosophy in the flesh: the embodied mind and its challenge to western thought. Basic Books, New York

Mactavish T (2009) The synthesis of design, technology, and business goals. In: Poggenpohl SH, Sato K (eds) Design integration: research and collaboration. Intellect Ltd, The University of Chicago Press, Chicago, pp 119–133

Mello S (2002) Customer-centric product definition. AMACOM, NewYork

Norman DA, Draper SW (1986) User centred system design: new perspective on human-computer interaction. Laurence Erlbaum Associates, Hillsdale

Oxford Dictionary of English (2003) Oxford University Press, Oxford

Reed ES (1996) Encountering the world: toward an ecological psychology. Oxford University Press, New York

Rosenzweig R (ed) (2003) Business frameworks. Fall 2003 course pack. Institute of Design, Illinois Institute of Technology, Chicago

Roto V, Law E, Vermeeren A, Hoonhout J (2011) User experience white paper: bringing clarity to the concept of experience. http://www.allaboutux.org/uxwhitepaper

Sato K (2009) Perspectives on design research. In: Poggenpohl S, Sato K (eds) Design integration: research and collaboration. Intellect Ltd, The University of Chicago Press, Chicago, pp 25–48

Schacter DL (1987) Implicit memory: history and current status. J Exp Psychol Learn Mem Cogn 13(3):501–518

Suchman L (2007) Human-machine reconfigurations. Cambridge University Press, New York

Suri JF (2005) Thoughtless acts?: observations on intuitive design. Chronicle books, San Francisco

Sward D, Macarthur G (2007) Making user experience a business strategy. Paper presented at the COST294-MAUSE affiliated workshop

Walls JG, Widmeyer GR, El Sawy OA (1992) Building an information system design theory for vigilant EIS. Inf Syst Res 3(1):36–58

Waterworth EL, Waterworth JA (2010) Mediated presence in the future. In: Bracken CC, Skalski PD (eds) Immersed in media: telepresence in everyday life. Routledge, Taylor & Francis Group, New York, pp 183–196

Waterworth JA, Lund A, Modjeska D (2003) Experiential design of shared information spaces. In: Höök K, Benyon D, Munro AJ (eds) Designing information spaces: the social navigation approach. Springer, Great Britain, pp 125–149

Waterworth JA, Ballesteros S, Peter C (2009a) User-sensitive home-based system for successful ageing paper presented at the 2nd international conference on Human System Interaction. Catania, pp. 542–545

Waterworth JA, Ballesteros S, Peter C, Bieber G, Kreiner A, Wiratanaya A, et al (2009b). Ageing in a networked society, social inclusion and mental stimulation. Paper presented at the 2nd International Conference on Pervasive Technologies Related to Assistive Environments

Zacks RT, Hasher L, Li KZH (2007) Human memory. In: Craik FIM, Salthouse TA (eds) The handbook of aging and cognition. LEA, Hillsdale, pp 293–358

http://www.springer.com/978-3-319-30332-1

Human-Experiential Design of Presence in Everyday
Blended Reality
Living in the Here and Now
Waterworth, J.; Hoshi, K.
2016, XI, 105 p. 23 illus., Hardcover
ISBN: 978-3-319-30332-1